MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2015/2016

TSE3151 – SOFTWARE DESIGN
TSD2711 – SOFTWARE DESIGN

(All Sections/Groups)

10 MARCH 2016
09:00 AM – 11:00 AM
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. The total number of pages for this examination paper is seven(7) pages including the cover page.

2. This examination paper contains a total of six(6) questions divided into two(2) different sections, Section A and Section B, respectively. Each section contains three(3) questions.

3. You are required to answer a total of four(4) questions. You must answer any two(2) questions from Section A, and any two(2) questions from Section B.

4. Each question carries an equal score of 25 points. The total score for this examination paper is 100 points.

SECTION A

(Answer any two(2) questions in this section)

QUESTION A1

A1(a) Answer the following questions. You may provide appropriate examples in your answers.

(a1) Describe three(3) main inputs for software design.
(a2) Provide three(3) characteristics of good requirement descriptions.
(a3) Provide three(3) reasons why system and software requirements must be documented.

[3 x 3 points = 9 points]

A1(b) Systems are designed based on requirements. Answer the following questions. You may use appropriate examples in your answers.

(b1) It was said, "*If the set of requirement descriptions cover all the items in the completeness criteria list, then the set of requirements is considered complete.*" Discuss this statement with reference to the FEDUPAAR acronym.

(b2) Explain one consequence or possible outcome of requirements that are not complete.

[2 x 3 points = 6 points]

A1(c) Discuss the following issues in terms of what they are and the context of how each term affects software design. You may provide appropriate examples in your answers.

(c1) Scenario based elements.
(c2) Class based elements.
(c3) Flow Oriented elements.
(c4) State Behavioural elements.
(c5) Interface based elements.

[5 x 2 points = 10 points]

Continued ..

QUESTION A2

A2(a) Answer the following questions. You may provide appropriate examples in your answers.

(a1) Explain what you understand by a design having a focus on *concurrency*.

(a2) What issues will have to be dealt with when the design focus is on *error handling and fault tolerance*? Provide at least two(2) issues for consideration.

(a3) What does it mean when a requirement specifies that the design must provide *data persistence*?

[3 x 3 points = 9 points]

A2(b) Consider the following issues in Object Oriented software design. You may provide appropriate examples in your answers.

(b1) The concept of a class is one of the defining features of Object Oriented Design (OOD). How is the *class abstraction* used in translating the system and software requirements into a software design model?

(b2) What is *encapsulation* in object-oriented design? What purpose does encapsulation achieve?

[2 x 3 points = 6 points]

A2(c) Discuss the following key issues and their impacts to the resulting software design. You have to describe what each issue means and what benefits it provides in software design. You may provide appropriate examples in your answers.

(c1) UML Activity Diagram
(c2) UML Swim Lane Diagram
(c3) The Single-Responsibility Principle (SRP) in object-oriented design
(c4) Distribution of software components
(c5) Database normalization

[5 x 2 points = 10 points]

Continued ..

QUESTION A3

A3(a) Answer the following questions. You may provide appropriate examples in your answers.

(a1) Why do we start software design by identifying use-cases and use-case scenarios from system and software requirements?

(a2) How do we identify potential use-case actors, for example, primary and secondary actors?

(a3) Explain what *pre-conditions* and *post-conditions* mean in the use-case identification activity.

[3 x 3 points = 9 points]

A3(b) Answer the following questions. You may provide appropriate examples in your answers.

(b1) What is the "monolithic design" architecture for a software system? Provide one(1) example of a system design using this architecture. In addition, provide one(1) advantage of implementing this design architecture.

(b2) Why is it that most complex software systems are built using the "N-Tiered design" architectures? Provide one(1) example of a system design using this architecture. In addition, provide one(1) advantage of implementing this design architecture.

[2 x 3 points = 6 points]

A3(c) Consider the following five(5) statements. Explain what each statement means.

(c1) *The client-server model of computing is a distributed application structure.*

(c2) *Platform as a Service (PaaS) design is one of the many implementations of the Service Oriented Architecture (SOA).*

(c3) *Every platform-based design architecture is unique.*

(c4) *A distributed design architecture is excellent when we need high scalability.*

(c5) *The peer-to-peer design architecture is a "masterless" architecture.*

[5 x 2 points = 10 points]

Continued ..

SECTION B

(Answer any two(2) questions in this section)

QUESTION B1

B1(a) Consider the software design architectures. Answer the following questions. You may provide examples in your answers.

(a1) The use of Python code in a software application is directly considered as the implementation of the *interpreter architecture* in software design. What does this implementation *architecture* mean?

(a2) Provide three(3) important issues that must be considered for systems that are designed to run in a *distributed and concurrent* manner.

(a3) What does design using *standardized component based* architectures mean? Provide two(2) examples of standardized software components.

[3 x 3 points = 9 points]

B1(b) Answer the following questions. You may provide examples in your answers.

(b1) Describe three(3) issues that may cause potential problems when *interfacing to specialized hardware systems* in our design.

(b2) Provide three(3) examples of existing design technologies that solve the problem of interfacing software codes with components built using different programming languages.

[2 x 3 points = 6 points]

B1(c) Discuss the following software systems and their implementations in terms of their design. It means you must briefly explain what these systems are used for and how they work.

(c1) Data-centric architecture system
(c2) Peer-to-Peer architecture system
(c3) Transaction Oriented system
(c4) Real-Time system
(c5) Android based system

[5 x 2 points = 10 points]

Continued ..

QUESTION B2

B2(a) Answer the following questions. You may provide examples in your answers.

(a1) Explain the meaning of the term *procedural design.* List four(4) categories of procedural design patterns.

(a2) Describe an example of what each of the following design patterns achieve:
- (a2.1) singleton pattern
- (a2.2) thread pool pattern
- (a2.3) lazy initialization pattern

(a3) Provide three(3) reasons for using software design patterns.

[3 x 3 points = 9 points]

B2(b) Answer the following questions. You may provide examples in your answers.

(b1) Explain three(3) differences between *multi-threading* and *multi-processing.*

(b2) How is the Message Passing Interface (MPI) library used in parallel and distributed processing? Explain how it can be used for local and distributed executions.

[2 x 3 points = 6 points]

B2(c) Answer the following design questions.

(c1) What do we know in the implementation of a ***(for .. loop)*** that we do not know for the same implementation using an equivalent ***(while .. loop)*** design?

(c2) Explain why optimization algorithms are the only solutions to our design problems in specific cases.

(c3) Explain how the Hadoop Distributed File System (HDFS) works.

(c4) How can a *race condition* happen in parallel and concurrent computing?

(c5) Describe a *deadlock situation* in parallel and concurrent computing.

[5 x 2 points = 10 points]

Continued ..

QUESTION B3

B3(a) Answer the following questions. You may provide suitable examples in your answers.

(a1) Provide three(3) reasons why we should use software frameworks in our software design.

(a2) Explain the AJAX framework (Asynchronous JavaScript And XML) in terms of how it works.

(a3) Why is the Microsoft Dot Net *architecture* sometimes also called the Microsoft Dot Net *framework*?

[3 x 3 points = 9 points]

B3(b) Answer the following questions. You may provide suitable examples in your answers.

(b1) Explain three(3) design challenges for "*Volume of Big Data, Velocity of Big Data and Variety of Big Data*" in its implementation.

(b2) Describe three(3) issues people are concerned about when software application codes and the associated application data are "*hosted in the clouds*".

[2 x 3 points = 6 points]

B3(c) Answer the following software design questions. You may provide suitable examples in your answers.

(c1) Describe one design method that we can implement to ensure *platform compatibility* for our software, that is, making it easy to port from one platform to another.

(c2) Describe one design method that we can implement to ensure *reusability for our software component*, that is, making it usable in a different application.

(c3) Demonstrate one example each of the steps you would take to implement the following good user interface (UI) designs.

(c3.1) Hide input details
(c3.2) Reduce user memory recall
(c3.3) Avoid unnecessary actions

[5 x 2 points = 10 points]

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